Practices of transdisciplinary research: close(r) encounters of science and society

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Introduction

Practices of transdisciplinary research: close(r) encounters of science and society

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YET ANOTHER SPECIAL ISSUE regarding inter- and transdisciplinarity may seem annoying to those readers who have followed the discussions about these issues in science policy circles. Inter- and transdisciplinarity have become buzzwords: their political prestige and ongoing fascination among researchers, notably in the domain of environmental or health issues, seem to rest on the impression that going inter- or transdisciplinary is 'the right thing to do'. They strike such chords as 'engage in responsible research', 'realize mutual learning' and 'orient science towards real-world problems and solutions'. Accordingly, transdisciplinary research has generated a host of projects and programs at all levels of funding (local, national, EU). Yet, little do we know as to how those research projects or programs, which explicitly claim to be part of such a new mode of knowledge production, actually operate.

Previous research on transdisciplinarity has often concentrated on programmatic, epistemological and conceptual questions. Studies on the practices of transdisciplinary research are few and mostly directed toward interdisciplinary research (eg Weingart and Stehr, 2000). The articles collected in this special issue cover both inter- and transdisciplinary research projects or programs. Based on empirical research, we set out to provide a first overview of a range of projects pursued in this new mode of knowledge production and ask what the specific features of these projects really are.

The introduction thus opens the floor for detailed case studies by first providing some definitions. Next, we give an overview of the themes of the articles and the methods employed. The main part of this introduction is devoted to a discussion of the findings of the articles assembled in this special issue: What are the different ways in which knowledge in transdisciplinary research is produced and evaluated? We will show that transdisciplinary research employs a wide range of institutional arrangements, procedures and methods in order to realize transdisciplinary knowledge production and evaluation. It will become evident that new modes of cooperative practices give rise to novel forms of organizing research which, in turn, structure cooperative research in novel ways. In addition to this, inter- and transdisciplinary research is about to have repercussions on university-based science at large.

From this perspective, these cooperative forms of knowledge production are not only interesting in themselves; they are also *a case for* a new order of academic knowledge production. The call for producing 'socially robust knowledge' that is not only scientifically sound but also socially acceptable exerts all kinds of disciplining effects on persons (eg on researchers, citizens, administrators, etc), organizations (eg funding agencies, cooperating firms),

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and on the system at large (eg growing significance of extra-scientific validation of research). Ultimately, all testify to inter- and transdisciplinary arrangements as examples of strengthening the relationship of science and society by way of bringing societal concerns right into the core of scientific research — thereby affecting the latter's goals, procedures, methods and standards of evaluation.

Definitions of inter- and transdisciplinarity

The pervasiveness of inter- and transdisciplinarity tends to confuse their precise meanings. In this special issue we proceed from the following definitions: inter- and transdisciplinarity cannot be defined without a proper understanding of disciplines. Disciplines are the main organizational structure of modern science. Historically, disciplines emerged along with universities as the prime organizations for knowledge production. Disciplines structure science in horizontal ways; they exist beside each other. A discipline controls its knowledge production by having a name, like 'sociology', and controlling a job market attached to this name (Turner, 2000).

In this world of disciplines, inter- and transdisciplinarity are those practices that consciously transcend the disciplinary mode of knowledge production. Inter- and transdiscplinarity are phenomena that can occur only after disciplines are defined and after those disciplines have occupied the main part of organized knowledge production in society. Interdisciplinarity then is a practice in which scientists from different disciplines work together. Interdisciplinarity is most often a temporary stage which either dissolves or leads to the founding of another new discipline (Weingart, 2000).

Transdisciplinarity includes interdisciplinarity but goes a step further and transcends the margins of science, understood as the organized production of knowledge in university-based disciplines. More precisely, transdisciplinarity transcends disciplinary science in two ways (Gibbons and Nowotny, 2001): first, it transcends science in relation to the *persons* involved. Transdisciplinarity involves non-scientists in the production and/or evaluation of knowledge. Second, it transcends science in relation to the *problems* involved. Transdisciplinarity explicitly orients its knowledge production *not only* around disciplinary problem-definitions but also around other definitions, derived from pressures, 'applications' or from societal stakeholders, no matter whether these be government agencies, private firms, NGOs or social movements. Both kinds of transgression depend on the observation that disciplines restrict and shut out certain persons (extra-scientific actors) from becoming part of knowledge production and also certain problems from becoming the focus of research (non-disciplinary issues). Transdiscplinarity is thus possible only after these restrictions have become observed and defined as problems.

In the remainder of this introduction we use only transdisciplinarity as a generic term. It is meant to include all kinds of above-mentioned transgressions of strictly disciplinary research, albeit in the knowledge that 'strict disciplinarity' is but loosely defined as a conventionalized set of terms, key questions and perspectives, methods and theories. Most importantly in our special issue, inter- or transdisciplinary arrangements are fundamentally alike in that they both challenge the set of authorized knowledge producers (they may come from different disciplines or from outside academia) and the problems to be addressed (situated at the interface of two or more disciplines or requiring extra-scientific knowledge).

Organizational levels of transdisciplinarity

In a world of disciplinary science, where does transdisciplinarity occur? As the articles in this special issue elucidate, transdisciplinarity is a phenomenon that is not restricted to universities. However, where transdisciplinarity occurs, disciplines are not far off. We can differentiate between different *institutional arrangements of transdisciplinarity:*

- A first type of transdisciplinary research projects can be found in universities (see Maasen and Lieven, this issue, pp. 399–410). Here, transdisciplinarity occurs because disciplines or interdisciplinary centers at universities do research projects that involve non-disciplinary stakeholders or problem definitions. In this case, transdisciplinarity occurs under the same organizational circumstances as other disciplinary research projects. All specificities of these projects are thus due not to their organizational form but to their content.
- A second type of transdisciplinary research is one pursued by non-university research organizations (see this issue Adam, Carrier and Wilholt, pp. 435–444; Guggenheim, pp. 411–421; and Lengwiler, pp. 423–434). Within this institutional arrangement, projects are housed in single organizations, but this time, the organizations are not primarily segmented along disciplinary lines. In their usual mode of operation, they include different stakeholders and problem definitions from a wide variety of sources. In this case, disciplines intervene as a blueprint insofar as they provide the standard practice of producing, communicating, and evaluating research for which transdisciplinary arrangements have to find functional equivalents.
- A third type of institutional arrangement is transdisciplinarity as a program. This type often presents itself as a project in terms of enlightenment, as a plan to make the world better, as an arrangement of means (Boltanski and Chiapello, 2000; Stanitzek, 1987). In our context, these are big research programs in which individual projects pursue disciplinary, interdisciplinary and/or

transdisciplinary research (see Kwa, pp. 457–467 this issue; and Pregernig, pp. 445–455). Even more pronounced than in single projects or small-scale local programs, international programs address a whole plethora of goals (scientific, political, economic, etc), involving not only scientists from diverse fields, but policy-makers, business people and other stakeholders. In these cases, it is the programs themselves that aim at transdisciplinarity (see Kwa).

To be sure, these three types of transdisciplinarity, although distinguishable as ideal types, often overlap in practice, as they do in the following articles. Yet, as ideal types they are helpful analytical tools, allowing us to see different aspects of the somewhat messy empirical phenomenon of transdisciplinarity. In the first type, transdisciplinarity occurs as an observable phenomenon because it introduces persons, practices and problems thought to be external to the modern university, a specific type of organization which invented disciplines in order to gain a certain autonomy from exactly these persons, practices and problems. The questions here are how much the different aspects of transdisciplinarity interfere with the traditions and structures of the organizational type 'university', or whether — and if so, how — the latter is changed by transdisciplinary arrangements of knowledge production. The second type allows us to investigate organizational forms outside the university which seem to adapt to knowledge production making use of and yet transcending the disciplinary matrix. The third type, the program type, highlights the problem area of integrating different kinds of stakeholders, knowledge and goals on a larger scale.

These types also point to three historical roots of contemporary practices of transdisciplinary research. The first type mirrors the attempt of the university system, at least since the 1980s, to reform its disciplinary organizations by strengthening ties to non-academic partners through means such as university–industry collaboration. The second, extra-university type of transdisciplinarity, points to similar reforms in 'big science' research institutions, also since the 1980s, additionally challenged by the formation of a lively field of innovative private research organizations such as in environmental research. Finally, the third type, transdisciplinary as a program, is an outcome of changes on the micro-organizational level of research projects, partly related to the institutional changes mentioned, such as the growing internationalization of research programmes (as in climate research) or the increasing demand by funding institutions for active knowledge and technology transfers between research and practice.

Common themes of the articles

The articles assembled in this special issue all provide us with detailed insights into different types of transdisciplinary research. Contrary to bold claims that transdisciplinarity is the ultimate solution to the blindness of disciplinary research, and contrary also to ridiculing it for its lack of methodological standards and efficiency, the articles in this issue paint a different picture. Yes, transdisciplinarity is different from disciplinary science, but only by degree, not fundamentally. It departs from the routines, constraints, problems and qualities of disciplines by exchanging them for other routines, constraints, problems and qualities. In brief: trans*disciplinarity* is disciplined as well, albeit in different ways.

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The articles address different levels on which transdisciplinarity becomes problematic in relation to different reference points. Each of them must be discussed in relation to the different types of transdisciplinarity as described above.

First of all, transdisciplinarity may be an issue on a *cognitive level*. This aspect is discussed in the articles of Adam, Carrier and Wilholt; Lengwiler; Maasen and Lieven; and Pregernig. Here the question is how a problem may be solved if different actors do not share the same disciplinary-based *Denkstil*, frame of reference, conceptual scheme, the same methods, theories, instruments, etc. Disciplinary problem constructions have the advantage of being able to provide a relatively narrow and specialized framework to tackle a problem, whereas non-disciplinary problem constructions must somehow narrow the methods and theories without having a reference at hand. Rather, the whole idea of transdisciplinarity is to cut through the disciplinary preformation of problem construction. Adam, Carrier and Wilholt show that simple tinkering does not provide easier solutions, but that theoretical constructions may, even in applied research, help to define a problem. Maasen and Lieven show that over an extended period of time different stakeholders may have different views about what the problem at stake actually is and how it should be solved. Even the status of the most important method — that is, a model — remains unclear during the project.

Thus, on the level of *scientific* methods and theories we find a predominance of empirical work with a strong focus on the effectiveness of the models and

theories employed. Furthermore, object-independent methods and theories, such as modeling, are often very important. They are used because they permit integrating methods and findings from different disciplines and also make it possible to integrate different parts of the world. Models enable integration of the knowledge of other stakeholders. Those object-independent methods do not introduce procedures from other social subsystems into science; what they do is to make science seemingly more universal. They open up scientific procedures to relatively non-specialized methods that are available to many disciplinary approaches.

Second, there are *organizational questions* involved. This has already become apparent in the description of epistemic issues above. The different methods and theories become visible and attributable as problems, because they are recognized as belonging to different disciplines or contexts, and these are usually rooted in different organizations. Research mostly takes place in organizations, and each organizational type develops its own routines, suited to the type of project it conducts, but also developing its own idiosyncrasies. In disciplinary research, such routines and idiosyncrasies are usually organized around disciplinary issues and the objects of research. In transdisciplinary research a multitude of new routines arise. There are usually several co-operating institutions involved, each with different routines.

Because neither the objects nor the disciplines restrict the issue of who is suitable to do a certain project, team composition becomes a crucial issue. Especially in the vast terrain of environmental problems, the set-up of a problem depends very much on the specialists involved in solving the problems. Then, once a team is established, a crucial question is how the different specialists work together (if at all), how they divide up between different tasks and how in the end, they reassemble the different parts, a question which is addressed in the articles of Pregernig, Lengwiler, and Kwa. On the organizational level, we find a clear tendency toward introducing managerial models used in other knowledge-intensive businesses. These are best described as understanding research practices as complex organizational tasks whose main variables are costs and flexibility. Thus the management of transdisciplinarity research is defined through an increasing use of financial controlling of research procedures and output as well as through complex organizational structures that allow setting up teams according to specific tasks and problems. Transdisciplinarity, in contrast to disciplinarity, thus loosens its dependency on scientific procedures and introduces organizational, object-dependent and economical procedures.

Third, *procedural questions* play a role in some of the articles. Procedural questions come to the fore partly because of the organizational complexity as described in the preceding paragraph, and partly because they have to supplement the lack of disciplinary procedures. As a result of organizational complexity, procedural questions become important as a means of coordinating complex tasks between different people and institutions. As long as a research project is handled within an organization or by one person only, working procedures may be handled tacitly. As soon as different actors with different understandings of work become involved, work procedures have to become negotiated. The problem becomes even more accentuated when work has to be coordinated between scientists and other stakeholders, as discussed in the articles of Maasen and Lieven, and Guggenheim. Organizing the research process becomes an object of close attention in itself, much to the disadvantage of the research process proper. The different stakeholders involved in transdisciplinary research call for a permanent monitoring of research which in turn leads to a constant production of interim reports and results (Maasen and Lieven, Guggenheim). Furthermore, proceduralization comes as the employment of management tools such as timesheets, ISO-certification and supervisory boards (Guggenheim), which become standard practice.

In Lengwiler's article, different ways to organize transdisciplinary work are discussed. With Lengwiler's categorization it becomes apparent that transdisciplinarity encounters organizational forms not as given and structured, but as contingent. On the procedural level we thus find a wide range of methods to document processes of research. They are, like the organizational ones, taken from other knowledge-intensive businesses. However, these methods are not specific to the knowledge, methods and theories involved. They are related to organizational processes independent of objects and themes. This again makes them applicable to all sorts of projects, irrespective of disciplinary viewpoints.

Taken together, these aspects of transdisciplinarity present a complex picture as a consequence of which a series of novel questions arise. To begin with, the phenomenon of transdisciplinarity can hardly be thought of as a unitary phenomenon but rather as a term to capture different phenomena linked to the recognition that some structures emerge if disciplines as the prime orientation for knowledge production are not applicable. Accordingly, the articles reveal all kinds of functional equivalents for methods and procedures that are otherwise performed by disciplines, such as standards for quality, the definition of research objects and problems, the use of methods and theories, and evaluative practices. On the evaluative level, transdisciplinary research partly replaces and enriches procedures of quality control through disciplines with criteria for social acceptance. Here the question is not so much — as has often been feared — that simply bad or false science is the result, but rather what such new criteria mean and how they are implemented. The multitude of extra-scientific goals, such as sustainability, ethical

acceptability, gender aspects and marketability, indicates that balancing work becomes an integral part of doing scientifically *and* socially 'sound science'.

While the articles convened in this special issue clearly testify to the disciplining effects of cooperative research on the level of persons, project and programs, it still remains an open question as to whether these observations permit diagnosis of a new order of knowledge production. While, empirically speaking, the multitude of practiced types of research — disciplinary or not — seems to counter such a claim, the picture changes slightly when one looks at the contemporary regime of knowledge production. Efficient production of useful knowledge has undoubtedly become the order of the day. From this perspective, the subsystem of science, its organizations and persons working in it increasingly succumb to a regime of effectively organizing the production of knowledge for solving societal problems — trying to incorporate all kinds of knowledge needed (from other disciplines or extra-scientific actors), values involved (ethics, gender, etc), in the context of local, national and international cooperation.

Hence, 'going transdisciplinary' is part and parcel of a specific relationship between science and society, characterized by usefulness and efficiency. While one faction applauds science as entering into real-world arrangements, the other laments dysfunctional effects of such a tight coupling of science and society. While for explicitly inter- and transdisciplinary research such a program is key, it is about to become standard in other disciplinary and university-based types of knowledge production as well. The articles in this special issue, while differing in their assessments, are united by an, albeit often implicit, call for attention. Their close encounters with transdisciplinary research caution against too close encounters between science and society.

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